STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
AMENDED
REPORT OF EXAMINATION
Application for Water Right # G2-30137
To Appropriate Public Waters of the State of Washington

APPLICATION DATE	APPLICATION NO.
August 1, 2003	G2-30137

NAME
Miller Land & Timber LLC

ADDRESS/STREET	CITY/STATE	ZIP CODE
600 University Street, Ste 3600	Seattle, WA	98101-3137

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Well (Tag BAC-331) Domestic supply

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	63gpm	10.8 ac-ft

QUANTITY, TYPE OF USE, PERIOD OF USE
10.8 ac-ft per year — Multiple domestic supply — Continuous use

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1,660 feet north and 980 feet east from the west quarter corner of Section 3, T.18 N., R.1W.M.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP	RANGE	WRIA	COUNTY
NW ¼ NW ¼	3	18 N.	1W.W.M.	13	Thurston

PARCEL NUMBER	LATITUDE	LONGITUDE	DATUM
11803220000	47° 04'49"N	122°47'52"	

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED
[Attachment 1 shows location of the authorized place of use and point(s) of diversion or withdrawal.]

NW ¼ NW ¼, Section 3, T18N, R1WWM

DESCRIPTION OF PROPOSED WORKS

6 inches by 371 ft deep, screened 361-366 ft 0.016-inch slots; 366-371 ft 0.018-inch slots

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE	COMPLETE PROJECT BY THIS DATE	WATER PUT TO FULL USE BY THIS DATE
December 31, 2012	December 31, 2013	December 31, 2018

PROVISIONS

1. MLT or any successor must implement low impact development (LID) techniques to control stormwater runoff, where practicable and allowed under applicable local regulations. Stormwater for Carpenter Ridge will be managed so off-site flows are equal to or less than flow from natural non-forested conditions. Carpenter Ridge is required to operate under a conservation plan to reduce water demand (e.g., requiring minimal outdoor water usage, drought resistant plants for landscaping, minimal disruption to native vegetation, etc.).

2. MLT or any successor must perform mitigation by augmenting stream flow from a well in Section 4, T.18 N., R.1W.M (Tag # BAC-363). Appropriation for stream augmentation for this project is permitted under G2-29951. Stream augmentation will begin concurrent with commencement of pumping for domestic water supply at Carpenter Ridge.

3. Stream flow augmentation for this project will consist of pumping at a minimum rate of 2 gpm (3.23 ac-ft per year) from PGPW (Application/Permit G2-29951). A temporary increase in maximum pumping to 4 gpm is allowed so that the augmentation rate averages 2 gpm over seven days following a system interruption (e.g., for required maintenance). MLT or any successor will pump water from the augmentation well and discharge to the ponded area of the unnamed tributary (Fox Creek) next to Pleasant Glade Road. The water will be directed to cascade over rocks to introduce dissolved oxygen before being discharged to the stream. The augmentation site will be landscaped to provide shade to ensure that water being introduced does not increase the temperature of the stream. Stream augmentation will operate year-round.

4. MLT or any successor will monitor the stream augmentation every two months for the first two years and four times a year (quarterly) thereafter. Annual reports must be submitted to Ecology by January 31. Each annual report will include:

   - Summary log of inspections recorded.
   - Spreadsheet of flow meter readings.
   - Graph of flow meter readings.
   - Estimate of the average monthly augmentation discharge.

   MLT or any successor can submit a formal request to reduce the frequency of compliance monitoring of the stream augmentation system after it has been fully operational for at least five years.

5. MLT or any successor must document that the augmentation system is working properly and mitigation requirements are being met. Monitoring will consist of visually inspecting the well and dispersal system. During each monitoring event, flow volumes measured by the totalizing meter must be recorded and the pump adjusted if needed to maintain the required pumping rate. Flow rate information will be recorded during each monitoring event. The totalizer reading will be used to estimate average discharge rate.

6. The flow augmentation may be interrupted for maintenance or repairs. Any scheduled interruption will occur when the disruption to flows in Woodland Creek are minimal. Work will be completed and the system will be returned to normal as soon as possible. If the augmentation system is unable to function for one week or more, especially during low-flow periods (June 1 through November 30), water use may be restricted to in-house use only. Terms for water use curtailment to comply with this provision will be included in the covenants, conditions, and restrictions for Carpenter Ridge.

7. Stream augmentation will continue in perpetuity or until withdrawals from Carpenter Ridge cease. MLT or its successors must comply with the terms of the mitigation program as a condition of the water right.

8. No later than 14 days before commencement of pumping for domestic water supply at Carpenter Ridge, MLT or any successor will provide documentation to Ecology's Southwest Regional Office of financial assurances in the minimum amount of $10,800. This minimum amount is considered sufficient to cover all operation costs of the augmentation system for one year. Financial assurances will be maintained as long as this water right is being exercised.

   MLT or any successor will provide annual financial assurances to maintain and operate the stream augmentation system no later than January 31 of each year. Such financial assurances will be in an amount adequate to cover the expected cost of work necessary to repair and maintain the stream augmentation system and the cost of electricity to operate the augmentation water supply pump for one year. This will include maintenance or repair of any pump, pipeline, rock installation, and landscaping.

   Any bond filed must be issued by a bonding company or licensed organization chartered by the State of Washington. Financial assurances required under this water right permit may be established by any one or a combination of these methods:

- Evidence of insurance.
- Surety bonds.
- Qualification as a self-insurer.
- Other evidence of financial responsibility.

Financial assurances provided under G2-29951 may be used to satisfy this requirement and vice versa.

9. MLT or any successor will be required to monitor flow in Fox Creek and Woodland Creek for 16 months once pumping associated with Carpenter Ridge begins and the stream augmentation system is operational. Stream flow in Fox Creek will be monitored using a v-notch weir and a continuous water level recorder. Woodland Creek discharge data is collected continuously by the Thurston County Storm and Surface Water Utility at the Pleasant Glade Road Bridge, immediately downstream from the confluence with Fox Creek. Discharge data will be submitted to Ecology in a report evaluating the stream flow data for the 16-month time period. The report will provide recommendations for ongoing monitoring, if necessary, and evaluate if the augmentation is working as expected.

10. MLT or any successor can submit a formal request to reduce the frequency of compliance monitoring of the stream augmentation system after it has been fully operational for at least five years.

11. Ecology will consider a formal request to substitute different stream augmentation source(s) in the future. However, Ecology is under no obligation to approve a new mitigation plan.

12. If domestic supply water from a public water system becomes available to serve the development, MLT or any successor must voluntarily relinquish all water rights associated with Carpenter Ridge. MLT or its successor will properly decommission the water supply well serving Carpenter Ridge in accordance with Chapter 173-160 WAC. If Carpenter Ridge connects to a public water supply system, the water right holder is no longer obligated to provide stream augmentation for domestic supply withdrawals from CRPW at PGPW. MLT or any successor must also decommission the augmentation well (PGPW) if augmentation associated with G2-29951 also ceases.

13. The subject well has been tagged with a well identification number. This unique well number must remain attached to the well. Please reference tag number when submitting data.

14. MLT or any successor must install and maintain an approved measuring device for wells authorized by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", Chapter 173-173 WAC. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements." These requirements can also be found on Ecology's internet website at http://www.ecy.wa.gov/programs/wr/measuring/measuringhome.html.

15. MLT or any successor must record water use weekly and maintain records for a minimum of five years. Weekly water use data, total monthly use, and maximum instantaneous withdrawal rate must be submitted to the Department of Ecology by January 31.

16. Water users can petition Ecology to ask for modifications to some of the metering requirements. To file a petition to request changes contact:

    Metering Coordinator
    Water Resource Program
    Southwest Regional Office
    Department of Ecology
    P.O. Box 47775
    Olympia, WA 98504-7775

17. Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Southwest Drinking Water Operations, 2411 Pacific Avenue, PO Box 47823, Olympia, WA 98504-7823, (360) 664-0768 prior to beginning (or modifying) your project.

18. Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above provisions, and to inspect any measuring device used to meet the above provisions.

19. MLT or any successor must not file the "*Proof of Appropriation*" until the permanent distribution system is constructed and the quantity of water allocated by the permit (to the extent water is required), has been put to full beneficial use. The quantity of water allocated may be reduced when the *Water Right Certificate* is

issued to reflect system capacity and actual usage. The *Water Right Certificate* will not be issued until a final investigation is made.

20. MLT or any successor must install and properly maintain the access port on water wells as described in Chapter 173-160 WAC. An air-line and gauge may be installed in addition to the access port.

FINDINGS OF FACT AND ORDER

Upon reviewing the investigator's report, I find all facts relevant and material to the subject application have been thoroughly investigated. Furthermore, I find the appropriation of water as recommended will not be detrimental to existing rights or to the public interest, and that water is available and will be used for a beneficial use.

Therefore, I ORDER the approval of Application No. G2-30137 subject to existing rights and the provisions specified above.

You have a right to appeal this decision. To appeal this you must:

- File your appeal with the Pollution Control Hearings Board within 30 days of the "**date of receipt**" of this document. Filing means actual receipt by the Board during regular office hours.
- Serve your appeal on the Department of Ecology within 30 days of the "**date of receipt**" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

Be sure to do the following:

- Include a copy of this document that you are appealing with your *Notice of Appeal*.
- Serve and file your appeal in paper form; electronic copies are not accepted.

1. To file your appeal with the Pollution Control Hearings Board

Mail appeal to:
The Pollution Control Hearings Board
PO Box 40903
Olympia WA 98504-0903

OR

Deliver your appeal in person to:
The Pollution Control Hearings Board
1111 Israel Road SW
Tumwater WA 98501

2. To serve your appeal on the Department of Ecology

Mail appeal to:
The Department of Ecology
Appeals Coordinator
P.O. Box 47608
Olympia WA 98504-7608

OR

Deliver your appeal in person to:
The Department of Ecology
Appeals Coordinator
300 Desmond Dr SE
Lacey WA 98503

3. And send a copy of your appeal to:

Thomas Loranger
Department of Ecology
Southwest Regional Office
PO Box 47775
Olympia WA 98504-7775

For additional information visit the Environmental Hearings Office Website: http://www.eho.wa.gov . To find laws and agency rules visit the Washington State Legislature Website: http://www1.leg.wa.gov/CodeReviser.

Signed at Lacey, Washington, this 28th day of September 2010.

Thomas Loranger

Thomas Loranger, Section Manager
Water Resources Program
Southwest Regional Office

PROJECT SUMMARY

Ecology denied the application on August 10, 2004 because the proposed withdrawal would capture groundwater that would otherwise contribute baseflow to Woodland Creek and its unnamed tributary (Fox Creek). Chapter 173-513 WAC closes Woodland Creek and its tributaries to further consumptive withdrawals. Miller Land and Timber, (MLT) subsequently appealed this decision before the Pollution Control Hearings Board (PCHB) on September 9, 2004 and was assigned Case No. 04-124.

Ecology approved the application on September 15, 2005 with mitigation proposed by MLT during settlement. The package included stream augmentation and water conservation to reduce water demand. These measures required landscaping with drought resistant plants so outdoor water use would be minimal, leaving as much native vegetation as possible and implementing stormwater management practices to control runoff.

The Squaxin Island Indian Tribe (SIT) filed an appeal of Ecology's approval of this application and Application No. G2-29951 (for the Pleasant Glade project). The appeals were combined under PCHB No. 05-137. The case was heard by the Pollution Control Hearings Board (PCHB) in May 2006.

On November 20, 2006, the PCHB issued its Modified Findings of Fact, Conclusions of Law and Order, vacating the Reports of Examination and remanding them back to Ecology. The SIT prevailed based on water availability and public interest. The remand allowed Ecology to issue a Preliminary Permit requiring MLT to drill and test a well so impacts to surface water could be better determined.

MLT was required to establish baseline conditions for both Woodland Creek and Fox Creek and monitor stream flows as a provision of the permit, if approved. MLT will also need to provide financial assurances to ensure stream flow augmentation would continue as required through perpetuity.

BACKGROUND

Application

On August 1, 2003, Eric Weber of Landau Associates, representing Miller Land and Timber, LLC (MLT) filed Application No. G2-30137 to withdraw public ground water from two wells. MLT requested 63 gallons per minute (gpm) and 13 acre-feet (ac-ft) per year for multiple domestic supply for 27 equivalent residential units (ERUs). The project site is located in the Deschutes River Watershed in Water Resources Inventory Area (WRIA) 13.

Project description

Carpenter Ridge is an approved preliminary plat on 40 acres in the Woodland Creek watershed in Thurston County in WRIA 13. The Woodland Creek watershed is in the Henderson Inlet Subbasin. Carpenter Ridge is between the Nisqually Reach (east) and Budd Inlet (west).

See Attachment #1

The site is undeveloped, consisting of gently rolling forest with elevations that range from about 80 to 120 ft above mean sea level (msl). A series of wetlands directly west of the Carpenter Ridge property form the headwaters of Fox Creek. The creek winds southwest before it empties into Woodland Creek, about ¾ mile southwest of the property. Woodland Creek discharges to Henderson Inlet approximately 1 ½ miles north of the confluence of Woodland Creek and Fox Creek. Both Woodland and Fox Creek support populations of chinook, chum, coho, sockeye salmon, and winter steelhead, all listed under the Endangered Species Act (ESA).

The 27 residential lots for Carpenter Ridge are in the southern portion of the property. The remainder of the land will be set aside for open space. Surrounding land use is comprised of single-family housing, medium-density housing developments, commercial property, and agriculture.

Table 1 *Summary of Application No. G2-30137*

Attributes	*Proposed*
Applicant	Miller Land and Timber, LLC
Date of Application	August 1, 2003
Instantaneous Quantity	63 gpm
Annual Quantity	10.8 ac-ft
Source	A Well
Point of Diversion/Withdrawal	NW ¼ NW ¼, Section 3, T18N, R1WWM
Purpose of Use	Multiple domestic supply
Period of Use	Continuous Use
Place of Use	NW ¼ NW ¼, Section 3, T18N, R1WWM

Legal requirements for application processing

The following items are required before a water right application can be processed:

Public Notice

Public notice was published in "The Olympian" of Olympia, Washington on February 26 and March 4, 2004. No protests were received from this publication.

State Environmental Policy Act (SEPA)

A SEPA determination evaluates if a proposed withdrawal will cause significant adverse environmental impacts. A SEPA threshold determination is required for the following conditions:

- Surface water applications for more than one cubic feet per second (cfs). For agricultural irrigation, the threshold increases to 50 cfs, if the project isn't receiving public subsidies.
- Groundwater applications requesting more than 2,250 gpm.
- Projects with several water right applications where the combined withdrawals meet the conditions listed above.
- Projects subject to SEPA for other reasons (e.g., the need to obtain other permits that are not exempt from SEPA).
- Applications that are part of several exempt actions that collectively trigger SEPA under WAC 197-11-305.

Ecology has reviewed the Mitigated Determination of Nonsignificance issued November 30, 2004 for the Carpenter Ridge project by Thurston County, the SEPA lead agency.

Water resources statutes and case law

Before approving a new application, RCW 90.03.290(3) requires Ecology to thoroughly investigate the facts. A new appropriation must satisfy each element of this four-part test:

- Water must be available for appropriation.
- The water must be for a beneficial use.
- Existing rights must not be impaired.
- Approving the appropriation must not be detrimental to the public interest.

RCW 90.03.290 (2) (a) allows Ecology to issue a Preliminary Permit so an applicant can conduct studies to gather information to assess a water right application. Ecology issued a Preliminary Permit on June 12, 2007 requesting MLT to drill wells and perform studies necessary to evaluate impacts the proposed pumping would have on surface water.

The Instream Resources Protection Program (IRPP) for the Deschutes River Basin Water Resource Inventory Area (WRIA) 13 (Chapter 173-513 WAC), closes Woodland Creek and its tributaries to further consumptive withdrawals that would clearly have an adverse impact to the surface water system.

Past proceedings

Ecology first denied the application on August 10, 2004. MLT appealed the denial before the PCHB on September 9, 2004. On September 15, 2005, Ecology approved the application during settlement when MLT proposed mitigation to offset impacts. The Squaxin Island Tribe (SIT) appealed Ecology's approval to the PCHB, Case No. 05-137.

During a five-day hearing before the PCHB, the SIT presented a numerical groundwater flow model, the Woodland Creek Model (Massmann and Romero, 2006), that estimated pumping impacts more than MLT predicted using the US Geological Survey (USGS) Thurston County groundwater flow model (1999). Based on the Woodland Creek Model, stream flow capture from the Carpenter Ridge and Pleasant Glade properties would be close to 80% of the pumping rate (Massmann and Romero, 2006).

Although MLT and Ecology presented information supporting their assumptions, in the end the PCHB found the SIT's numerical groundwater model to be more persuasive. The SIT prevailed in showing the applications could not meet two of the four-part criteria for new permits under RCW 90.03.209. These two criteria were water availability and public interest. In the end, the Board vacated the decisions and remanded them back to Ecology.

On remand, the PCHB required:

- Establishing baseline conditions of Woodland Creek and Fox Creek, but no instream flows need to be set.
- Ecology's issuance of a Preliminary Permit to perform pumping tests so impacts of pumping to surface water can be determined to evaluate water availability.
- Ongoing surface water monitoring when the augmentation system is operating so measures can be taken if it is not working as planned.
- MLT to provide financial assurances in an appropriate amount and form to ensure that stream augmentation will continue as directed in the future.

INVESTIGATION

Information evaluated

This *Application for a Water Right* was evaluated using the following information:

- Washington Groundwater and Surface Water Codes, administrative rules, and policies.
- Water right certificates, permits, claims, and applications on record with the Department of Ecology.
- Water well reports recorded in the Department of Ecology's Well Log Image System.
- Topographic and local area maps.
- Documents related to the Squaxin Island Tribe v. Ecology, PCHB Case No. 05-137.
- Letter from John Konovsky (SIT) to Tammy Hall (Ecology) dated February 28, 2007, with attached memorandum from Joel Massmann, Ph.D., P.E. (Keta Waters) dated February 27, 2007, re: review of Draft Preliminary Permit.
- Ecology Preliminary Permit for Ground Water Applications G2-29951 and G2-30137, issued June 12, 2007.
- Landau Associates, March 24, 2008, "*Preliminary Permit Report for Groundwater Applications G2-29951 and G2-30137, Thurston County, Washington.*"
- Letter from Jeff Dickison (SIT) to Ecology dated May 21, 2008, with attached memorandum from Joel Massmann, Ph.D., P.E. (Keta Waters) dated May 14, 2008, re: comments on Preliminary Permit report.
- Memorandum from Eric Weber (Landau) to Ecology dated October 13, 2008, "*Response to Squaxin Island Tribe Comments on the Preliminary Permit Report.*"
- Memorandum from Eric Weber, LHG (Landau) to Tammy Hall, (Ecology) dated May 19, 2009, *"Proposed Mitigation Plan, Miller Land and Timber, LLC, Groundwater Permit Application Nos. G2-29951 and G2-30137."*
- Memorandum from Eric Weber, LHG (Landau) to Tammy Hall, (Ecology) dated November 18, 2009, *"(refinements to) Proposed Mitigation Plan, Miller Land and Timber, LLC, Groundwater Permit Application Nos. G2-29951 and G2-30137."*
- McDonald Morrissey Associates, Inc. May 5, 2009, "*Critique of Models Submitted to State of Washington.*"
- Memorandum from Joel Massmann, Ph.D., P.E. (Keta Waters) to John Konovsky (SIT) dated September 1, 2009, *"Reply to critique of Models Submitted to State of Washington by McDonald Morrissey Associates, May 5, 2009."*

Site visit

Site visits were conducted on May 26, 2004 and February 2, 2005. Tammy Hall met with representatives of MLT, Eric Weber and Katherine Laird, and representatives of Washington Department of Fish and Wildlife (WDFW), Hal Beecher, Steve Boessow, and Al Wald, to inspect Woodland Creek and Fox Creek. Other field investigations were conducted by Brad Caldwell, fisheries biologist with Department of Ecology's Water Resources Program, on April 19, 2005.

Previous work

When MLT filed the application for the Carpenter Ridge property in 2003, a previous study by Landau (2003) was used as supporting information. This report acknowledged that the proposed withdrawals would likely affect stream flows in Woodland Creek and Fox Creek. Because of these conclusions, Ecology denied G2-30137 in August 2004. MLT appealed the decision before the PCHB on September 9, 2005. This appeal was assigned Case No. 04-124.

In 2005, *Miller v. Ecology* settled when MLT offered mitigation consisting primarily of augmenting stream flows to Fox Creek, a tributary of Woodland Creek, from a well on the Pleasant Glade property (Application G2-29951). This property was also owned by MLT. MLT proposed to concentrate mitigation during low-flow season so benefits to the stream would be greater (ROE, 2005). Stream capture was estimated using a zone budget analysis from the USGS Thurston County numerical groundwater flow model (Drost, 1999).

The mitigation plan proposed required MLT to perform regular monitoring to document the stream augmentation was properly working and the mitigation requirements were being met. MLT was also required to submit annual reports tracking the mitigation action to Ecology. In addition, the ROE had provisions that required deed restrictions to ensure mitigation would continue in perpetuity, although the funding mechanism was not specified. MLT also accepted provisions requiring low impact development and design techniques (LID) to be applied to the project.

On September 15, 2005, Ecology issued an amended ROE approving the application with the mitigation plan MLT submitted. At the time the application was approved, no wells had been drilled. All assumptions regarding impacts were based on existing information, including the USGS model, previous studies, and water well reports for wells near the project area.

Preliminary Permit

Preliminary Permit conditions

In response to the PCHB decision vacating the 2005 ROE and remanding the application back to Ecology, Ecology issued a Preliminary Permit to MLT on June 12, 2007. A Scope of Work defined in the Preliminary Permit included the following tasks:

- Installing pumping wells at Pleasant Glade (G2-29951) and Carpenter Ridge properties.
- Performing step drawdown tests at both the Pleasant Glade and Carpenter Ridge pumping wells.
- Performing pumping tests at both the Pleasant Glade and Carpenter Ridge properties.
- Analyzing pumping test data to estimate aquifer parameters.
- Refining the conceptual model of the area.
- Monitoring Fox Creek and compiling stream flow rates for Woodland Creek to evaluate any changes due to pumping a well.
- Evaluating and refining the current Woodland Creek groundwater flow model using site-specific data.
- Collecting and analyzing groundwater quality data to assess suitability for surface water stream augmentation.

Pleasant Glade and Carpenter Ridge wells

Two wells were drilled on the Carpenter Ridge property. The Carpenter Ridge monitoring well (CRMW) is about 1,000 feet east of Carpenter Ridge Road and was drilled in 2006, before the Preliminary Permit was issued. The Carpenter Ridge pumping well (CRPW) is about 40 feet east of CRMW. CRPW is the domestic supply well that will provide water to the Carpenter Ridge development.

The Pleasant Glade pumping well (PGPW[1]) was used as a monitoring well for the Carpenter Ridge pump tests. Difficulties encountered while drilling through a thick clay layer required special drilling techniques until a sand layer was encountered at about 487 ft below ground surface (bgs) (Landau, 2008A). PGPW is directly south of the Fox Creek wetland and will be used to augment streamflow.

See Attachment #1

Table 2 summarizes details of CRMW and CRPW. Construction details of PGPW are summarized in Table 3.

[1] Referenced in Applications G2-29951 and G2-30137 as Well 1.

Table 2. *CRMW and CRPW (domestic supply well) construction details.*

	CRMW	CRPW (domestic supply well)
Date Drilled	May 15, 2006	July 11, 2007
Surface elevation (ft above mean sea level, msl)	119	119
Well diameter (inches, in)	6	6
Completed depth (ft below ground surface, bgs)	337	373
Perforations or screens (ft bgs)	Screened 327-337 (0.020 inch slot)	Screened 361-366 (0.016 inch slot) 366-371 (0.018 inch slot)
Static water level (ft bgs)	51.8	50
Date measured	November 14, 2007	November 14, 2007
Pumping capacity (gpm)		200

Table 3. *PGPW (stream augmentation well) construction details.*

	PGPW (stream augmentation well)
Date Drilled	November 2, 2007
Surface elevation (ft above mean sea level, msl)	91
Well diameter (inches, in)	5
Completed depth (ft below ground surface, bgs)	555
Perforations or screens (ft bgs)	Screened 543-553 (0.012 inch slot)
Static water level (ft bgs)	26.8
Date measured	November 14, 2007
Pumping capacity (gpm)	32

Site stratigraphy

Well reports for CRMW and CRPW report a similar sequence of materials consisting of various amounts of gravel and sand, with minor amounts of silt until about 200 ft bgs, when the formation changes to blue clay. This clay layer measures about 120 ft thick at CRPW, and about 100 ft thick at CRMW. Both Carpenter Ridge wells are completed in sand and gravel beneath the clay layer.

A similar stratigraphic sequence exists at PGPW (stream augmentation well). However, the clay layer was much thicker, around 315 ft. The clay designation was verified by conducting an Atterberg test on a sample collected at 435 ft bgs at PGPW. Atterberg tests are used to distinguish between silt and clay.[2] Although Landau reported occasional thin sandy or silty layers, most of the unit consisted of a massive plastic clay. Thin layers of sand in a massive clay unit have a minimal effect on vertical hydraulic conductivity (Landau, 2008A). Later, at the request of Ecology, Landau performed six additional Atterberg tests on samples from the clay layer, which confirmed the initial test assessment (Landau, 2008B).

Landau reviewed other deep wells drilled in the area and compared them PGPW, CRMW, and CRPW. The Harkins and Wargacki wells, drilled in 2005 and 2007, respectively, and PGPW were drilled by the same driller. Well reports for both the Harkins and Wargacki wells also show a clay layer between 140 and 500 ft thick, extending to as deep as 200 ft below mean sea level. Logs for other wells also report a thick sequence of clay occurring at about the same depth (Landau, 2008A).

A more recent surface geologic map of the project area prepared by DNR (Logan, 2003) also confirms the presence of a clay deposit. DNR maps the surface geology in the area near Woodland Creek as Qgof and Qgos, which are fine-grained soil associated with local lacustrine (lake) and ice-contact conditions. The United States Soil Conservation Service (USCS, 1990) maps this area as Skipopa silt loam, a soil type formed over glacio-lacustrine sediments. These deposits underlie most of the Woodland Creek model area, except where more recent alluvium or peat occurs at the surface (Landau, 2008A).

[2] Atterberg limits are conducted according to the American Society of testing Materials (ASTM) D-4318 Specification.

Changes to Preliminary Permit work plan

When the work plan for the Preliminary Permit was approved, it was assumed that the aquifer system was leaky (PCHB Modified Findings of Fact, 2006) and a hydraulic connection existed between the aquifer being pumped and flows in Woodland Creek. In the work plan, MLT had planned to drill a shallow well in the Qva at Pleasant Glade to monitor the shallow aquifer response to pumping during the pump tests. Since the Qva is in direct hydraulic communication with Woodland Creek, effects on surface water from pumping a deeper aquifer would be easier to detect than by directly measuring flows in Woodland Creek. MLT had planned to place a transducer in the well that would have detected a drop in pressure, indicating a hydraulic connection between the shallow aquifer and the aquifer being pumped.

However, when drilling on-site wells revealed a clay layer (identified as the Qf unit by Landau) 315 ft thick at PGPW and 120 ft thick at CRPW, a direct hydraulic connection between surface water and the aquifer being pumped appeared unlikely. Therefore, based on Landau's recommendation, Ecology and Landau agreed installing the shallow well in the Qva was not warranted.

Pump tests

PGPW, CRMW, and the Wargacki well were selected to monitor all phases of the pump tests. CRMW is about 40 feet from CRPW. The Wargacki well is further away, roughly 1,800 feet from CRPW. CRPW and PGPW are about 3,600 feet apart. All these wells are screened in the same aquifer.

The pumping test consisted of a baseline period, a step-drawdown test, a pumping period, and a recovery period. The baseline period lasted for five days. A step drawdown test was performed first to determine the final design pumping rate for the test. Pumping and recovery portions of the test each lasted 48 hours (changed from 72 hours).

Pumping began on November 19, 2007 and ended 48 hours later, on November 21. The pumping rate was constant at 200 gpm. Table 4 summarizes maximum drawdown in all wells for the pumping test.

Aquifer transmissivity and storativity were estimated using data from the 48-hour constant rate pump test. The range in values is likely from aquifer heterogeneities and partial penetration near the pumping well. The aquifer hydraulic conductivity was based on an aquifer thickness of 34 ft. Aquifer properties derived from the Carpenter Ridge pump test are summarized in Table 5.

Pumping test procedures and detailed data analysis is presented in Landau (2008A).

Table 4. *Measured drawdown from Carpenter Ridge pumping test.*

Well	Drawdown (ft)	Approximate distance from pumping well (ft)	Depth of screened interval (ft) or depth of well casing (ft
PGPW	0.7	3,600	543-553
CRPW	121	0	361-371
CRMW	11.8	40	337-347
Wargacki Well	0.9	1,800	380

From Landau (2008A)

Table 5. *Aquifer parameter estimates from Carpenter Ridge pumping test.*

Well	Transmissivity (ft^2/day)	Hydraulic conductivity* (ft/day)	Storativity
PGPW	2,610	77	0.0002
CRPW	1,430	42	N/A
CRMW[3]	980	29	0.0005
CRMW[4]	1,180	35	N/A
Wargacki Well	7,200	212	0.0002

From Landau (2008A)

Water quality

Water quality samples collected from CRPW and PGPW were analyzed in accordance with DOH requirements for Group A water systems and to ensure water from PGPW would be suitable for mitigation. Water samples were collected about 15 minutes before the end of each test.

Water quality at PGPW, the streamflow augmentation well, is typical of deep aquifers in the area. The water will be acceptable for mitigation once dissolved oxygen is introduced by cascading water over rocks.

[3] Calculated using Hantush-Jacob (1955) and Hantush (1964) analysis from pumping and recovery data.
[4] Calculated using Cooper-Jacob (1946) straight line analysis with recovery data.

Baseline flow monitoring for Fox and Woodland creeks

The minimum base flow for 2007 was 12.6 cfs (5,655 gpm) and 0.45 cfs (200 gpm) for Woodland Creek and Fox Creek, respectively.

Flow discharge for Fox Creek was monitored for six months beginning August 2, 2007 and ending January 17, 2008. Discharge was measured using a v-notch weir south of Pleasant Glade Road. Stage was recorded with a continuous water level recorder. Flow peaked on December 3, 2007 at 48.3 cfs, whereas summer base flow was lowest in August and September. Flow remained low until the winter rains began in November.

Woodland Creek stage and discharge data was collected from the Thurston County Storm and Surface Water Utility stream discharge gage at the Pleasant Glade Road Bridge. Hourly stage and discharge data was available for the time period between May 23, 2007 and December 3, 2007. The discharge data shows that flow peaked on December 3, 2007 at 246.4 cfs and was lowest on November 30, 2007.

Changes in surface water flows from both Fox and Woodland creeks correlated directly to rainfall events, with one exception. During the last week of August 2007, a peak in flow from Fox Creek was likely because the grate across the Fox Creek culvert at Pleasant Glade Road was removed. Removing the grate lowered water levels in the Fox Creek pond/wetland (Landau, 2008A).

No visible decline or change in stream flow was observed during the period of pump testing between November 16 and 27, 2007. (Landau, 2008A)

Hydrologic/hydrogeologic evaluation

General area geology/hydrogeology

Previous ROEs discussed area geology related to this project. In general, the surface deposits and landscape in Thurston County is a product of several glacial advances and retreats, the most recent glacial episode taking place about 10,000 years ago (Vashon). The more-recent surface deposits are typically alluvium deposited by streams.

The nomenclature of the glacial deposits varies with the geologic study. The two most-recent studies were by the USGS in 1998 (Drost) and Washington Department of Natural Resources in 2003 (Logan). Vashon age deposits characteristically consist of the following sequence of deposits:

- Recessional outwash, Qvr (Drost, 1998) or Qgo (Logan, 2003).
- Glacial till, Qvt (Drost, 1998) or Qgt (Logan, 2003).
- Advance outwash Qva (Drost, 1998) or Qga (Logan, 2003).

Underlying Vashon-age deposits is a thick interglacial sequence. These sediments are finer-grained than the Vashon deposits and are referred to as the Kitsap Formation [Qf (Drost, 1998) or Qps (Logan, 2003)]. An older glacial sequence of coarse sand and gravel called Salmon Springs drift or Penultimate drift [Qc (Drost, 1998) or Qpg (Logan, 2003)] is beneath the Kitsap Formation. Older deposits underlying Salmon Springs and Penultimate drift are undifferentiated or TQu.

The Woodland Creek Model

The Woodland Creek Model, developed by Massmann and Romero (2006) for the SIT's PCHB appeal (PCHB No. 05-137) covers about four square miles.[5]

The Woodland Creek Model was presented as a small local model within the domain of the regional USGS model (Drost, 1999) developed using telescopic mesh refinement (TMR). TMR is a way of representing a system in a small area within the context of the larger regional model by high resolution (small cells). TMR derives boundary conditions from the regional model, in this case the USGS model, with low resolution (large cells).

Massmann and Romero used General Head Boundaries (GHB) to define the flow into the Woodland Creek Model domain. GHB require an elevation and a conductance value. The stated basis for selecting GHB conductance values was through Woodland Creek Model calibration (Massmann and Romero, 2006). No data was presented in the Woodland Creek Model Report that attempted to correlate groundwater flow values between the regional model and the local model as is typically done when using a TMR approach.

In the Woodland Creek Model, the average thicknesses of the first four hydrogeologic layers in the model (Qvr through Qf) were consistent with the USGS model representation. However, the layer thicknesses in the local model were not uniform and represented as being thin or completely missing under the northern portion of

[5] An updated version of the Woodland Creek Model was produced at the beginning of the PCHB hearing, but not introduced into evidence. Landau used this updated version as a starting point for re-evaluating impacts of proposed pumping after the PCHB decision.

Woodland Creek. This geologic interpretation was not based on direct geologic information and no specific geologic explanation for this trend was presented in the Woodland Creek Model report (Massmann and Romero, 2006). Additionally, the hydraulic properties of the Qf, the confining layer between the shallow Qva aquifer and the Qc, were increased by a factor of 10. This increase in hydraulic properties was not based on actual geologic testing data. The thicknesses of all other layers were roughly the same as in the 1999 USGS model, "*Conceptual Model and Numerical Simulation of the Ground-Water Flow System in the Unconsolidated Sediments of Thurston County, Washington*" (Drost, 1999).

For the simulation, Massmann and Romero used a pumping rate of 100 gpm for Pleasant Glade and determined 84% of the water pumped from the well was captured from Woodland Creek under steady state (e.g., very long-term) pumping from model layer 5 (i.e., Qc aquifer). Massmann and Romero completed a similar analysis for Carpenter Ridge that determined 80 % of groundwater pumped was captured from Woodland Creek. Based on these percentages, Massmann and Romero estimated that stream capture from Woodland Creek due to pumping during the summer (low-flow periods) would be 54 gpm.

The revised Woodland Creek Model

The Woodland Creek Model was revised by Landau to incorporate new information collected as a result of the Preliminary Permit. The Revised Woodland Creek Model included three primary changes from the original (updated) model:

1. The thickness of the Qf aquitard (Layer 4 in the model) was increased based on observations made during well drilling.
2. The hydraulic conductivity of the Qf aquitard was decreased based on observed soil types.
3. Inflows along the model boundaries were adjusted through calibration.

Landau redefined the elevation and thickness of Layer 4 (confining layer, Qf or Qps) to correspond to the thickness of the clay layer found in well borings both on and near the project area. The horizontal and vertical hydraulic conductivity of the Qf was also changed to more appropriately represent a clay (horizontal hydraulic conductivity: 2×10^{-3} ft/day, vertical hydraulic conductivity: 2×10^{-4} ft/day). By comparison the horizontal and vertical hydraulic conductivities used by Massmann and Romero (2006) in the Woodland Creek Model was 1.0 ft/day and 0.01 ft/day, respectively. Hydraulic conductivity values in this range are consistent with silt to silty-sand deposits, rather than clay (Freeze and Cherry, 1979; Driscoll, 1986).

Conductance values for the model perimeter GHB were also modified. Landau adjusted the GHB values so groundwater flow rates along the perimeter of the model more closely approximated groundwater flow conditions predicted by the USGS Thurston County groundwater flow model (Landau, 2008A).

The revised Woodland Creek Model predicts much smaller impacts. Predicted streamflow capture from pumping at Carpenter Ridge using the revised Woodland Creek Model averages about 0.9% compared to predicted streamflow capture of about 80% using the original Woodland Creek Model.

If the Carpenter Ridge well is pumped at the permitted amount of 10.8 ac-ft (27 ERUs), 0.060 gpm would be water captured from the creek once the system reached steady-state conditions. (Landau, 2009B)

Proposed works and water demand

The Carpenter Ridge system will supply water to 27 connections and will be operate as a Group A water system. The average daily demand is calculated using Washington Department of Health (WDOH) guidelines and the following mathematical equation:

$$ADD = \left(\frac{8000}{AAR}\right) + 200$$

Where: ***ADD*** = *Average Day Demand, (gallons-per-day/ERU)*

AAR = *Average Annual Rainfall, (inches-per-year)*

Using climate information for Olympia, the average daily demand for 27 residences should not exceed 360 gallons per day per residence. The total water demand for this project should not exceed 10.8 ac-ft per year. This calculation assumes an annual water usage of 0.4 ac-ft per residence. The calculated instantaneous rate to serve the development will be 63 gpm.

Mitigation proposal

Stream augmentation

MLT proposes to mitigate the predicted impacts by discharging groundwater directly to Fox Creek. The objective of the mitigation is so pumping associated with the development will not reduce streamflow in Woodland and Fox creek.

Stream augmentation will take place at the Pleasant Glade property from PGPW under Application G2-29951. PGPW is adjacent to Fox Creek. MLT proposes to augment streamflow at a minimum rate of 2 gpm averaged over a seven-day period for the Carpenter Ridge development. This amount is more than sufficient to offset predicted impacts of 0.060 gpm from pumping CRPW and 0.022 gpm from pumping PGPW for stream augmentation. MLT will voluntarily increase the amount mitigated by 1.92 gpm. Stream augmentation will take place year-round.

Water will be dispersed by a valve or weir system to keep the pumping rate constant. Discharge will be recorded using a totalizing flow meter. The meter will be read periodically and the augmentation rate will be adjusted as necessary so the discharge rate averages 2 gpm over seven days.

A conveyance system will extend from the augmentation well on the Pleasant Glade property to the ponded area of Fox Creek, adjacent to the well. The piped conveyance will discharge water to a cascading water system to introduce dissolved oxygen into the water before it flows into the creek. The augmentation site will be landscaped so water being introduced does not increase the temperature of the pond. (Landau, 2009A)

Compliance and monitoring

MLT or will monitor the stream augmentation every two months for the first two years and four times a year (quarterly) thereafter. Annual reports must be submitted to Ecology by January 31 of each year. Each annual report will include:

- Summary log of inspections recorded.
- Spreadsheet of flow meter readings.
- Graph of flow meter readings.
- Estimate of average monthly augmentation discharge.

The augmentation report must document that the system is working properly and mitigation requirements are being met. Monitoring will include visually inspecting the well and dispersal system. During each monitoring event, flow volumes measured by the totalizing meter must be recorded and the pump adjusted if needed to maintain the required pumping rate. Flow rate information will be recorded during each monitoring event. The totalizer reading will be used to estimate average discharge rate.

Stream augmentation will continue in perpetuity or until withdrawals from the on-site domestic well at Carpenter Ridge cease. MLT or any successor must comply with the terms of the mitigation program as a condition of this water right.

MLT can submit a formal request to reduce the frequency of compliance monitoring after the system has been fully operational for at least five years.

Contingency plan

The flow augmentation may be interrupted for maintenance or repairs. Any scheduled interruption will occur when impacts on Woodland Creek will be minimal. Work will be completed and the system will be returned to normal as soon as possible. If the augmentation system is unable to function for one week or more, especially during low-flow periods (June 1 through November 30), water use will be restricted to in-house use only. Terms for water use curtailment will be included in the covenants, conditions, and restrictions for Carpenter Ridge.

Financial assurances

No later than 14 days before commencement of pumping for domestic water supply at Carpenter Ridge, MLT or any successor will provide documentation to Ecology's Southwest Regional Office of financial assurances in the minimum amount of $10,800. Financial assurances will be maintained as long as this water right is being exercised.

MLT or any successor will provide annual financial assurances to maintain and operate the stream augmentation system no later than January 31 of each year. This will include maintenance or repair of any pump, pipeline, rock installation, and landscaping. Such financial assurances will be in an amount adequate to cover the expected cost of work necessary to repair and maintain the stream augmentation system and the cost of electricity to operate the augmentation water supply pump for one year.

Any bond filed must be issued by a bonding company or licensed organization chartered by the State of Washington. Financial assurances required under this water right permit may be established by any one or a combination of these methods:

- Evidence of insurance.
- Surety bonds.
- Qualification as a self-insurer.
- Other evidence of financial responsibility.

Financial assurances provided under G2-29951 may be used to satisfy this requirement and vice versa.

Potential for other mitigation

Ecology may consider a formal request to substitute different stream augmentation sources in the future. However, Ecology is under no obligation to approve a new mitigation plan.

On-going surface water monitoring

Baseline conditions for Woodland Creek (12.6 cfs, 5,655 gpm) and Fox Creek (0.45 cfs, 200 gpm) have been established, as required by the Pollution Control Hearings Board in PCHB No. 05-137 (Paragraph 122). The Board also required on-going surface water monitoring to allow measures to be taken in case the stream augmentation does not work as expected (Paragraph 126).

Consistent with the PCHB ruling, MLT or any successor will be required to monitor Fox Creek for at least 16 months. This period covers two minimum baseflow seasons after pumping associated with the project begins and stream augmentation is implemented.

Stream flow in Fox Creek will be monitored in the same manner as under the Preliminary Permit, using a v-notch weir and a continuous water level recorder. Likewise, Woodland Creek discharge data is collected continuously by the Thurston County Storm and Surface Water Utility at the Pleasant Glade Road bridge immediately downstream from the confluence with Fox Creek. Discharge data from both creeks will be submitted to Ecology in a report evaluating the stream flow data for the 16-month time period. The report will provide recommendations for ongoing monitoring, if necessary, and evaluate whether the augmentation is working as anticipated.

If stream flow monitoring identifies reductions flow because of water use associated with Carpenter Ridge, Ecology may impose additional mitigation requirements to mitigate pumping impacts on Fox Creek and Woodland Creek.

Low-impact development

MLT or any successor will implement, where practicable and as allowed under applicable local regulations, low impact development (LID) techniques to control stormwater runoff. LID techniques incorporated in Ecology's 2005 Stormwater Management Manual for Western Washington (February 2005 update) were used as a reference tool for MLT to propose to Thurston County when the Carpenter Ridge plats were pursued through the land review process. The Carpenter Ridge Preliminary Plat was approved with conditions by the Thurston County Hearing Examiner on May 11, 2005. At Carpenter Ridge, MLT will implement the following LID techniques incorporated into the Preliminary Plat:

- Clustered lots requiring less infrastructure.
- Minimal impervious area and reduced site disturbance.
- Narrow rural roadway sections.
- Directing sheet flow to swales and treatment bioswales along roadways.
- Infiltrating roof drain runoff into dry wells.
- Treating stormwater runoff locally before conveying to an onsite infiltration pond.
- Infiltrating stormwater to recharge the shallow aquifer.
- Preserving part of the site as a Resource Use Parcel pursuant to Thurston County Planned Rural Residential Development regulations.
- Incorporating sensitive areas and site features that intercept, evaporate, store and transpire precipitation.

Stormwater for Carpenter Ridge will be managed so off-site flows are equal to or less than the flow from natural non-forested conditions. In addition, Carpenter Ridge will be required to operate under a conservation plan to reduce water demand (e.g., requiring minimal outdoor water usage, drought resistant plants for landscaping, minimal disruption to native vegetation, etc.).

Water availability

When the PCHB allowed Ecology to require MLT to secure a Preliminary Permit, a primary concern was water availability and the potential of groundwater withdrawals to impact flows in a basin closed by rule to further consumptive appropriations.

The Preliminary Permit required drilling and testing of wells at both Carpenter Ridge and Pleasant Glade properties. During the drilling of these wells, a plastic clay layer 120 ft thick at Carpenter Ridge and 315 ft thick at Pleasant Glade, was encountered. Pump test results did not show a direct hydraulic connection between pumping from these wells to flows in Woodland Creek or Fox Creek. The revised Woodland Creek Model confirmed impacts to surface water from pumping at Carpenter Ridge to be 0.060 gpm for domestic supply. Impacts from stream augmentation at Pleasant Glade are expected to be about 0.022 gpm. This is an overall average of about 0.9% of the amount pumped or 0.082 gpm.

The PCHB ruled in PCHB No. 05-137 (Order on Motions, May 19, 2006) that a groundwater withdrawal coupled with mitigation to compensate for surface water impacts may be approved under the Deschutes River Basin Rule (Chapter 173-513 WAC), provided the four-part test is satisfied. Because MLT is proposing to mitigate predicted impacts to Woodland and Fox creeks, groundwater is available for appropriation, notwithstanding the closure of Woodland Creek. MLTor its successors will provide direct stream augmentation of 2 gpm which will more than offset predicted impacts associated with Carpenter Ridge withdrawals.

Additionally, pump testing of both CRPW and PGPW shows enough water is available to provide for both domestic supply and stream augmentation.

Impairment considerations

Effects to existing water users

Nearby water users whose wells are completed in the same aquifer as a new proposed withdrawal have the greatest potential to experience impairment. Impairment occurs when water availability is interrupted or interfered with and a significant modification is required in order for a senior groundwater right to be fully exercised. Impairment can also occur when water becomes contaminated and needs treatment in order to be useable (i.e. seawater intrusion).

WAC 173-150-060 specifies only withdrawals that negatively impact "qualifying withdrawal facilities" fit the legal definition of impairment. Qualifying withdrawal facilities are fully penetrating wells completed in the same aquifer as the new point of withdrawal. A fully penetrating well spans the aquifer's entire saturated thickness and allows a reasonable variation in seasonal water levels. This definition allows wells to be affected, especially shallower wells, but the impacts are not considered impairment.

This permit allows withdrawals 10.8 ac-ft and 63 gpm for domestic supply at the Carpenter Ridge property from a well 337 ft deep. This water system is expected to serve a proposed development of 27 homes. Withdrawals from CRPW for domestic supply will be mitigated by stream augmentation on the Pleasant Glade property from PGPW, to be authorized under Application No. G2-29951.

Ecology's databases were queried to determine the number of water right certificates, permits, and claims in a radius of one mile from CRPW. This radius was selected considering groundwater divides near the project area.

The search identified nine groundwater certificates. Details of these certificates are summarized below in Tables 4 and 5.

Table 4. Groundwater certificates within ½ mile from CRPW.

File #	Priority Date	Person	Purpose	Pumping rate (gpm)	Annual quantity (ac-ft)	Well depth (ft)	Distance from CRPW (ft)
G2-28785	3/3/1993	Shawn & Denise Brownlee	Domestic supply Stockwater	50	0.65	60	700
G2-28742	2/8/1993	Paul Shoblom	Domestic Supply Irrigation	200	10.5	392	1,200
G2-26221A	12/5/1997	Washington Water Service	Domestic supply	60	10	153	2,000
G2-25478	1/30/1980	Marvin Rd Water Co.	Domestic supply	125	99.5	153	2,500

Table 5. Groundwater Certificates from ½ mile to one mile from CRPW.

File #	Priority Date	Person	Purpose	Pumping rate (gpm)	Annual quantity (ac-ft)	Well depth(ft)	Distance from Well 2(ft
G2-25286	7/9/1979	Clearwater Utilities	Domestic supply	80	30.5	280	3,000
G2-26220	8/27/1982	Washington Water Service	Domestic supply	75	40	258	3,900
G2-26746	7/24/1985	Washington Water Services	Domestic supply	199	134	258	3,900
G2-24015	3/28/1975	Tolmie Cove Associates	Domestic supply	110	29.6	200	4,000
G2-23768	6/7/1971	Jones Graham, et ux	Domestic supply	40	14	182	4,000

It is not likely area water uses will be impaired by withdrawals associated with Carpenter Ridge. Wells completed in the same aquifer as PGPW and CRPW are far away and have enough available drawdown that users will easily be able to pump their certificated quantities. Wells completed in shallower aquifers are separated from PGPW and CRPW by a thick sequence of clay and would be unlikely to be affected by pumping.

Following is a summary of remaining water right certificates, claims, and wells within ½ to one-mile radius from CRPW:

- Ten surface water certificates and one certificate of change have been issued authorizing a combined instantaneous amount of 0.7 cubic feet per second (cfs) and 40.5 ac-ft per year. Water use is from streams (Woodland Creek , its tributaries, and springs) for domestic supply, irrigation, and stockwater.
- Twenty ground and surface water claims are registered. The locations of these claims are not known.
- Forty-two water well reports are on file with Ecology. Thirty-two wells are less than 150 ft deep and likely draw water from above the Qc (Sea Level Aquifer). The remaining ten wells from 200 to 545 ft deep and could draw water from the Qc.

Effects to surface water

Minimum instream flows were established in 1988 through Chapter 173-513 WAC, the Instream Resources Protection Program (IRPP) for the Deschutes River Basin Water Resource Inventory Area (WRIA) 13. This IRPP closes Woodland Creek and its tributaries to further consumptive withdrawals. Future groundwater withdrawals are affected by this closure if they will have a clear adverse impact on surface water.

Groundwater withdrawals from the Carpenter Ridge development are not expected to adversely impact surface water. Although groundwater withdrawals would capture groundwater that would otherwise contribute baseflow to Woodland Creek and Fox creeks, the impacts will be minor. MLT has proposed to augment stream flow that will more than offset any surface water impacts. Stream augmentation will take place year-round.

Public Interest considerations

Approving this application is not detrimental to the public interest and consistent with Chapter 173-513 WAC and RCW 90.54. Even though pumping may impact surface water, the amount will be small and stream augmentation will compensate predicted impacts from pumping. Under RCW 90.44.055, Ecology is obligated to consider resource management techniques, like stream augmentation, to offset impacts of a groundwater withdrawal.

MLT or its successors will be subject to metering and reporting requirements. MLT or any successor will be required to monitor the effectiveness of the stream augmentation program and provide financial assurances for continued operation of the stream augmentation system. In addition, Carpenter Ridge will be required to operate

under a water conservation plan to reduce water demand (e.g., requiring minimal outdoor water usage, drought resistant plants for landscaping, minimal disruption to native vegetation, etc).

Consideration of protests and comments

The SIT and Washington Department of Fisheries and Wildlife (WDFW) previously expressed concerns about the proposed appropriation. Since issuance of the Preliminary Permit in 2007, the SIT reviewed and commented on information gathered from drilling wells and pump testing, and refinements made to the Woodland Creek Model. The SIT has continued to assert the original Woodland Creek Model, not the revised Woodland Creek Model, should be used to predict impacts of groundwater pumping.

The primary concern of the proposed appropriation is with impacts pumping would have on surface water in Woodland and Fox creeks. After the PCHB's decision in 2006, a Preliminary Permit allowed site specific information to be gathered so impacts to surface water could be better predicted. This information confirmed the existence of a very thick and continuous clay layer that effectively isolates surface water in Woodland and Fox creeks from the aquifer being pumped. This information was not available when the SIT developed the Woodland Creek Model.

The revised Woodland Creek Model incorporates the information gathered from the Preliminary Permit to better reflect actual site conditions. The SIT's criticism of the revised Woodland Creek Model ignores this significant new information. Using the new information gathered about hydrologic conditions and the results of the revised Woodland Creek Model, MLT has prepared a mitigation plan that more than offsets the impacts proposed pumping will have on surface water in Woodland and Fox creeks

Other concerns previously expressed are addressed below:

- **Groundwater used to augment stream flows will not deteriorate the water quality of ambient waters of Woodland and Fox creeks**. Water quality testing of the mitigation well (PGPW) confirmed its suitability for stream augmentation. The design and engineering of the stream augmentation system will protect the water quality in Woodland and Fox Creeks. Before stream augmentation water is discharged, oxygen will be introduced by cascading over rocks. The area around the discharge site will be shaded so the temperature of the receiving waters will not increase and dissolved oxygen levels will not decline. Dissolved oxygen is critical for fish survival.

- **Seawater intrusion does not appear to be a potential risk at the Carpenter Ridge or Pleasant Glade properties.** Eight wells sampled in 1989 (Drost, 1998) within one mile show chloride levels ranging from 2.4 to 9.6 milligrams per liter (mg/L) for wells completed in the Qva, Qvt, Qc, and TQu. These levels are considerably less than the Maximum Contaminant Level (MCL) for chloride of 250 milligrams per liter (mg/L). WDFW staff previously raised concerns about chloride levels in nearby wells but did not provide evidence to support the concerns in testimony before the PCHB. In the end, the PCHB agreed with Ecology's determination; that the proposed wells do not pose any discernable water quality problems (Modified Findings, Paragraph 90.)

- **MLT or any successor is required to provide financial assurances for ongoing maintenance and operation of the stream augmentation system.** The assurances will provide adequate funds to provide the cost of electricity to operate the stream augmentation pump and complete any expected work necessary to maintain and repair the system as needed. This will include maintenance of any pump, pipeline, rock installation, and landscaping. These financial assurances must be renewed annually and are required as long as the water right is exercised.

- **Pump testing of both the Carpenter Ridge well and the Pleasant Glade mitigation well confirm adequate water is available for both domestic supply and stream augmentation.** Each well taps a productive aquifer similar to other domestic water supply wells in the area.

- **The Carpenter Ridge project will comply with all applicable ordinances regarding critical areas, buffers and open-space, and stormwater management.** Carpenter Ridge is a clustered subdivision which reserves a significant area in open space. The preliminary plat for Carpenter Ridge has already been approved by Thurston County. The project incorporates low impact development techniques. MLT will meet stormwater management guidelines and ordinances (such as managing any stormwater so that off-site flows would be equal to or less than the flow from natural non-forested conditions).

- **Carpenter Ridge will be required to operate under a water conservation plan to minimize water demand.** Lots will be landscaped so outdoor water use is minimal, such as using drought resistant plants for landscaping, and minimal disruption to native vegetation, etc. Water use will be restricted to in-house only if there is a prolonged interruption of the stream augmentation system. Because of the project's overall design, water demand for Pleasant Glade will be much lower when compared to piece-meal development of individual parcels with exempt wells.

- **Surface water impacts will be mitigated year-round.** The SIT appealed the PCHB's decision, arguing Chapter 173-513 WAC does not permit any unmitigated groundwater withdrawal, even during high flow periods (PCHB Modified Findings, Paragraph 113). In recognition of the SIT's position, MLT has proposed year-round stream augmentation. Because surface water impacts will continually be mitigated, withdrawals from Pleasant Glade or Carpenter Ridge will not, at any time, impact salmon, steelhead, cutthroat trout, or other species dependent on streamflows in Woodland or Fox creeks.

FINDINGS AND CONCLUSIONS

This application requests water for multiple domestic supply and stream augmentation. Multiple domestic supply is considered a beneficial use.

- Chapter 173-513 WAC closes Woodland Creek and its tributaries to further consumptive withdrawals. WAC 173-513-050 states that future ground water withdrawal proposals will not be affected by this chapter unless such withdrawals would clearly have an adverse impact upon the surface water system.

- When withdrawals from Carpenter Ridge are mitigated by augmenting streamflows to Woodland and Fox creeks, water is available for appropriation.

- When withdrawals from Carpenter Ridge are mitigated by augmenting streamflows to Woodland and Fox creeks, this appropriation is not detrimental to the public interest.

- The issuance of this water right will not impair any senior water right holders.

RECOMMENDATIONS

Based on the above investigation and conclusions, I recommend Application No G2-30137 be approved in the amounts and limits listed below, subject to provisions beginning on Page 2.

Purpose of Use and Authorized Quantities

The amount of water recommended is a maximum limit and the water user may only use that amount of water within the specified limit that is reasonable and beneficial.

- 63 gpm.
- 10.8 ac-ft .
- Domestic Supply.

Point of Withdrawal

- 1,660 feet north and 980 feet east from the west quarter corner of Section 3, T.18 N., R.1W.M.

Place of Use

As described on Page 1 of this Report of Examination.

Report by: _____ 9/27/2010

Tammy Hall, L.HG., Water Resources Program — Date

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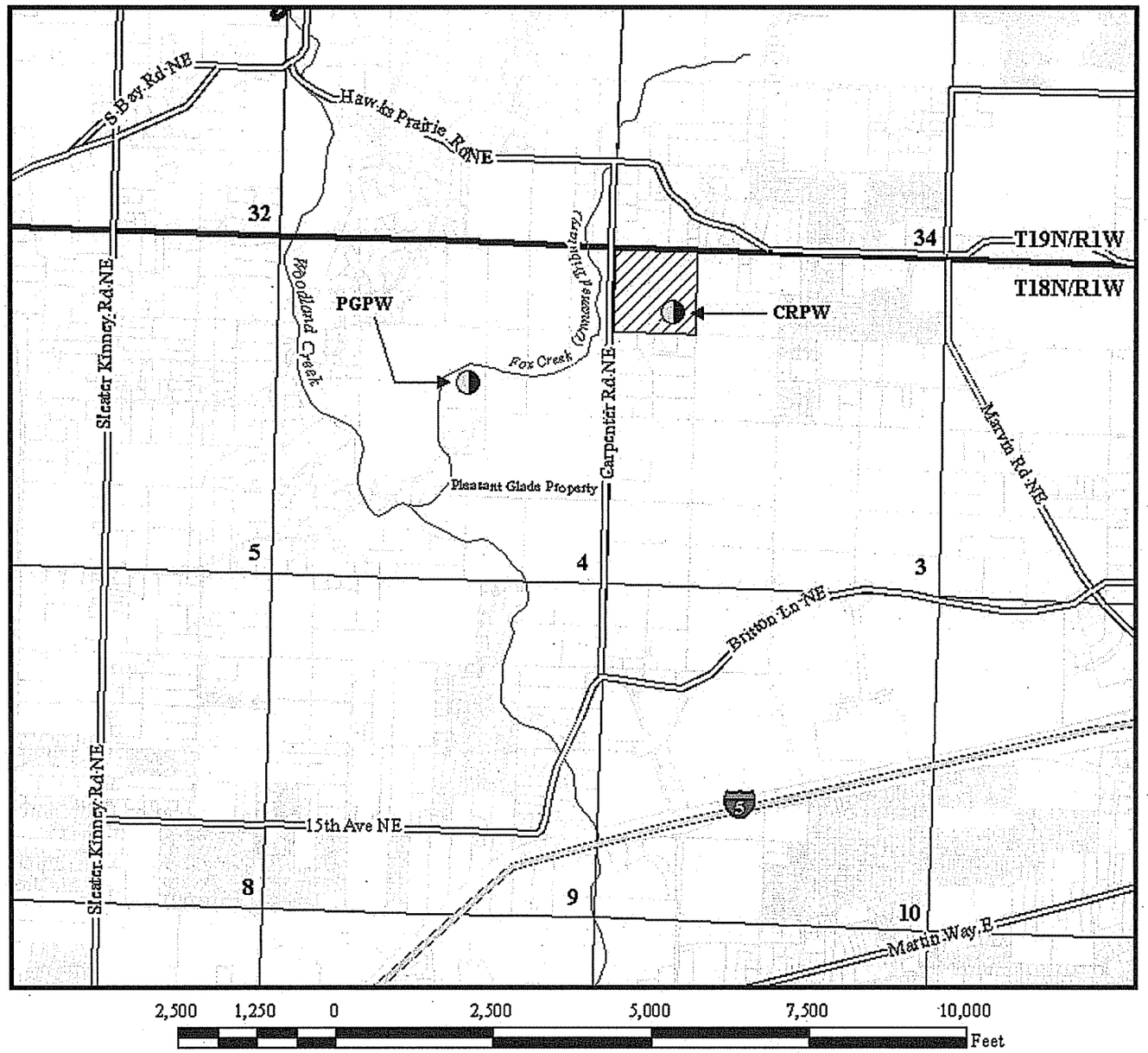
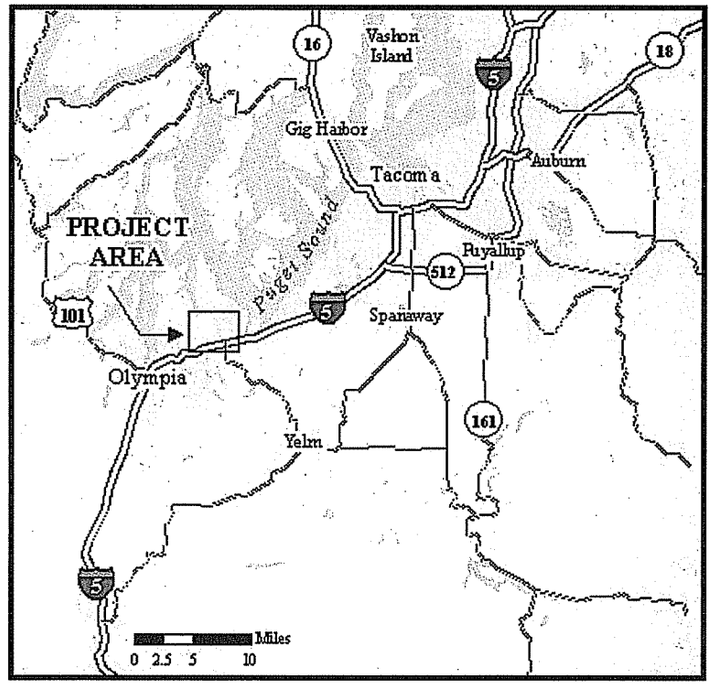


Miller Land and Timber LLC
Water Right Number G2-30137
Sec. 3 T 18 N, R 1 W.W.M.
WRIA 13 - Thurston County

DEPARTMENT OF ECOLOGY
State of Washington



ATTACHMENT 1

Legend

- WELL LOCATIONS (POW)
- PLACE OF USE (POU)
- THURSTON CO. PARCELS
- HIGHWAYS
- SECTION LINES
- TOWNSHIP LINES
- CITIES
- ROADS

Comments:

Place of use, points of withdrawal/diversion are as defined on the cover sheet under the heading, 'LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED.'

Map Created 2/4/2010 aln